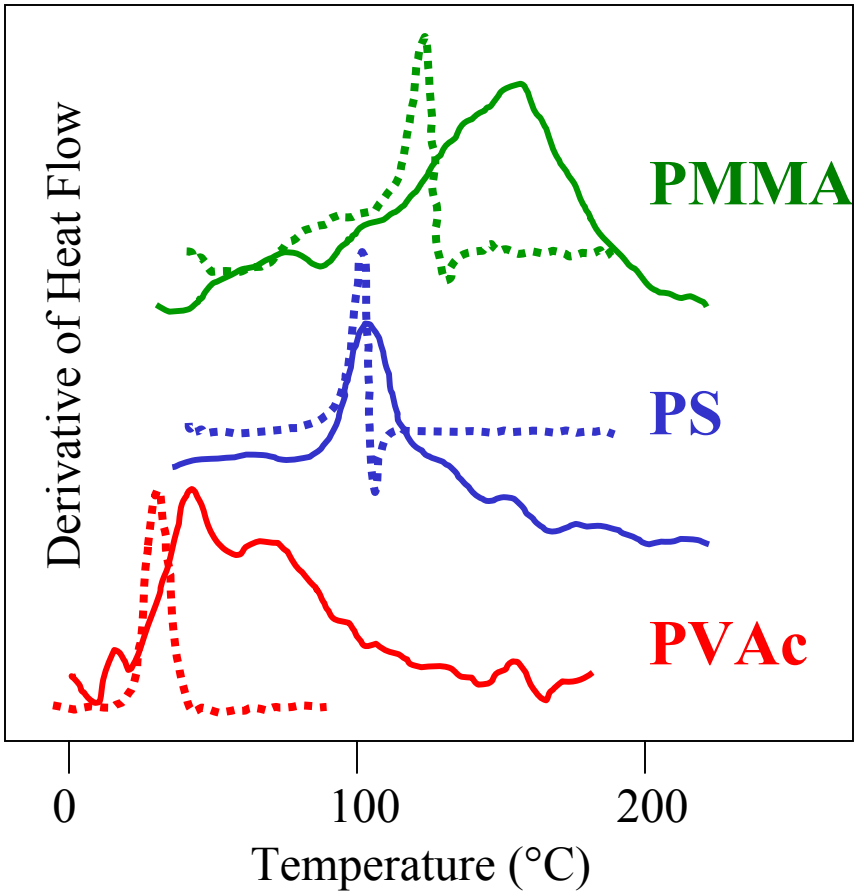
Segmental Dynamics in Ultra-thin Polymer Layers

Frank D. Blum, University of Missouri-Rolla, DMR-0107670

The properties of thin layers of polymers change as the layers get *ultra-thin* (as in electronic devices). We have been able to use Modulated Differential Scanning Calorimetry (MDSC) to probe the thermal behavior of bulk and adsorbed polymers. Some polymers like PMMA (plexiglas™) and PVAc (white glue) exhibit higher temperature (and broader) glass transitions when adsorbed on silica. Other polymers like PS (CD cases) show only a small broadening in glass transition when adsorbed. This knowledge will help device manufacturers choose the right polymer for their applications.

- for example, see:

Bing Zhang and Frank D. Blum, Modulated Differential Scanning Calorimetry of Ultra-thin Adsorbed PS-r-PMMA Copolymers on Silica, *Macromolecules* **36**, 8522-7 (2003).



Thermal activity of poly(methyl methacrylate) PMMA, polystyrene (PS) and poly(vinyl acetate) (PVAc) in bulk (- - - dashed) and on silica (——solid).

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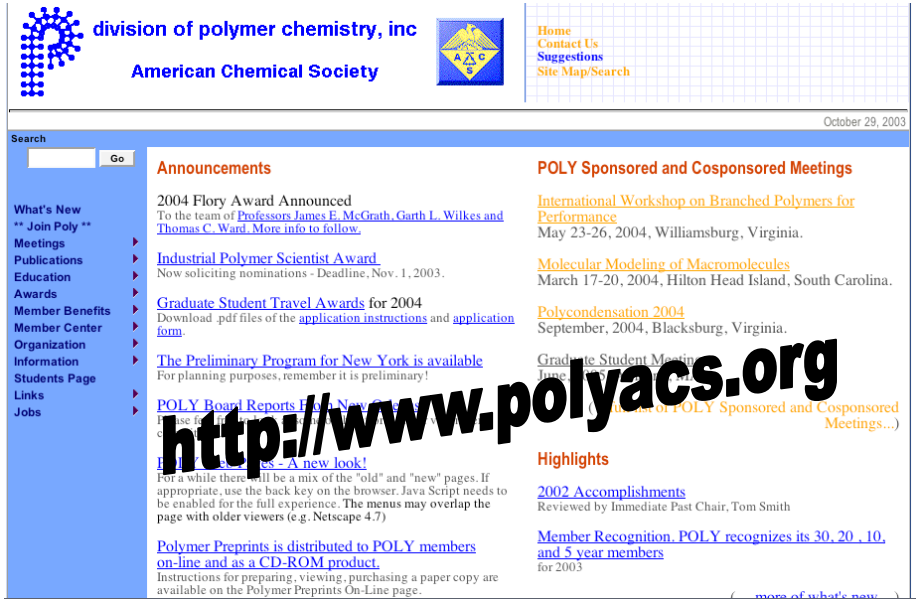
Education:

Undergraduates Madeleine Philpot (UMR) and Greg Smith (currently at U. Bristol, England) plus graduate students Bing Zhang (PhD 2003, currently at GE), Erin Young (UMR), Tim McKeon (UMR), Burak Metin (UMR) and Crystal Porter (PhD 2001, currently at Loreal) contributed to this work.

The PI is a Director of the Rolla Public Schools.

Outreach:

The PI participates in many education-related activities including service to the American Chemical Society (ACS), Division of Polymer Chemistry (POLY) and the Rolla Public Schools.
See: http://www.umr.edu/~fblum



The PI is webmaster for POLY. The web site has information and links on education and science for students, professionals, Division members and the public.